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Variational Principles and Applications of Local Topological Constants of Motion for Non-Barotropic Magnetohydrodynamics ASHER YAHALOM, Ariel University — Variational principles for magnetohydrodynamics (MHD) were introduced by previous authors both in Lagrangian and Eulerian form. In this talk we introduce simpler Eulerian variational principles from which all the relevant equations of non-barotropic MHD can be derived for certain field topologies. The variational principle is given in terms of five independent functions for non-stationary non-barotropic flows. This is less than the eight variables that appear in the standard equations of barotropic MHD that are the magnetic field B the velocity field v, the entropy s and the density ρ. The case of non-barotropic MHD in which the internal energy is a function of both entropy and density was not discussed in previous works that were concerned with the simplistic barotropic case. It is important to understand the rule of entropy and temperature for the variational analysis of MHD. Thus, we introduce a variational principle of non-barotropic MHD and show that five functions will suffice to describe this physical system. We will also discuss the implications of the above analysis for topological constants. It will be shown that while cross helicity is not conserved for non-barotropic MHD a variant of this quantity is. The implications of this to non-barotropic MHD stability is discussed. Asher Yahalom "Simplified Variational Principles for non-Barotropic Magnetohydrodynamics". (ArXiv: 1510.00637 [Plasma Physics]) J. Plasma Phys. (2016), vol. 82, 905820204 ©Cambridge University Press 2016.

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